

Android-Powered Head Unit

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Project Overview

Our project is to build and program a navigation/head unit for a car that is developed using the Android mobile operating system. The head unit will be developed using a tablet as well as other hardware to allow it to communicate with the car. It would be wired into the car's 12V outlet to receive power, the car's antenna to use for data signal, the car's stereo for audio signal, and the car's OBDII port for vehicle information. The head unit will be able to receive diagnostic information from the car's OBDII, and project it into an application so that information can be read and viewed easily by the user. This can be used to show problems with the car, as well as performance items such as gas mileage, oil temperature, tire pressure, speed, and tuning information. As well as being able to read information from the car, you can also use this interface to listen to music and use GPS for navigation. The head unit will be developed in a way that will allow it to be removed from the car. This will allow you to use this head unit as a stand-alone tablet, and also provides added security to avoid theft. It also allows for third-party outside analysis of performance data, if desired.

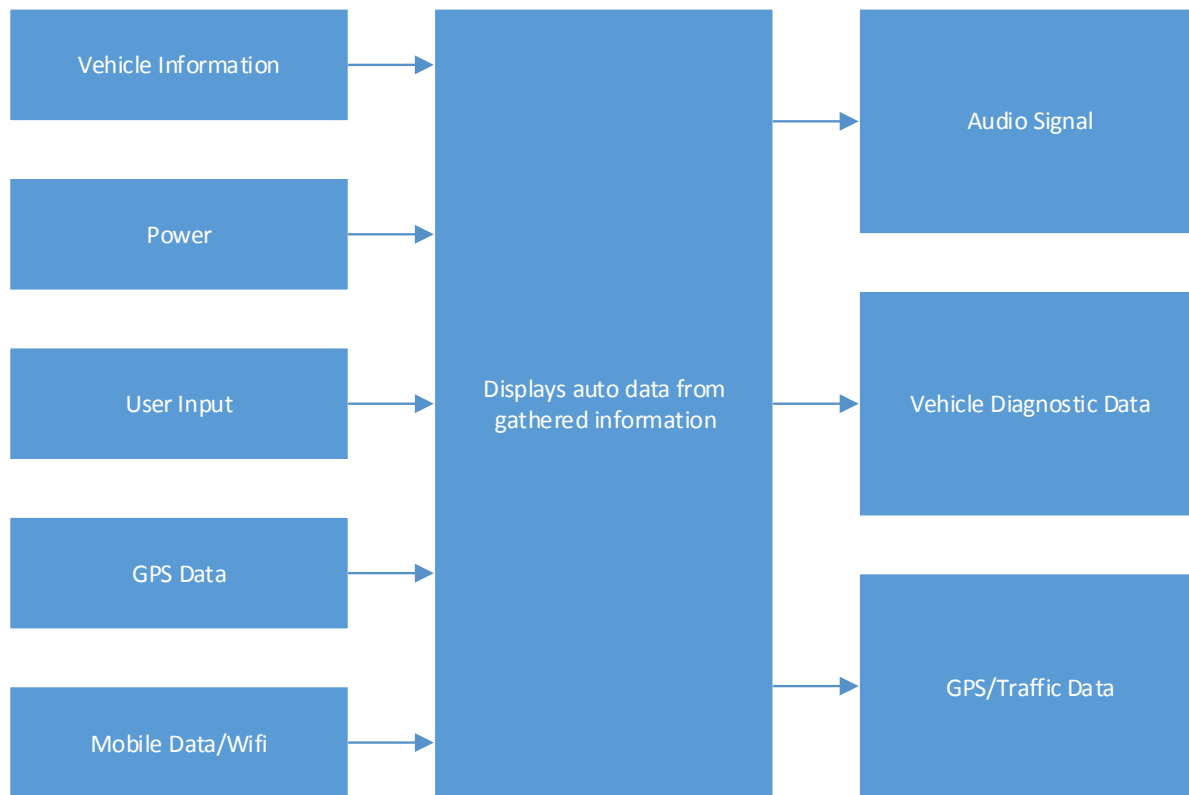
Assignment Responsibilities

After reviewing the components that could be considered for the design of this project, all the members worked together to decide how each component would function and communicate with each other. This is how we were able to construct the functional diagrams. By knowing the desired needs and relative limitations of our design, we are able to come up with multiple functional solutions. It also helps us rule out what diagrams may or may not be possible or plausible.

	Jan, Patrick	Kaminski, Gregory	Mischin, Frank	Rue, Justin
Percent Effort:	25%	25%	25%	25%

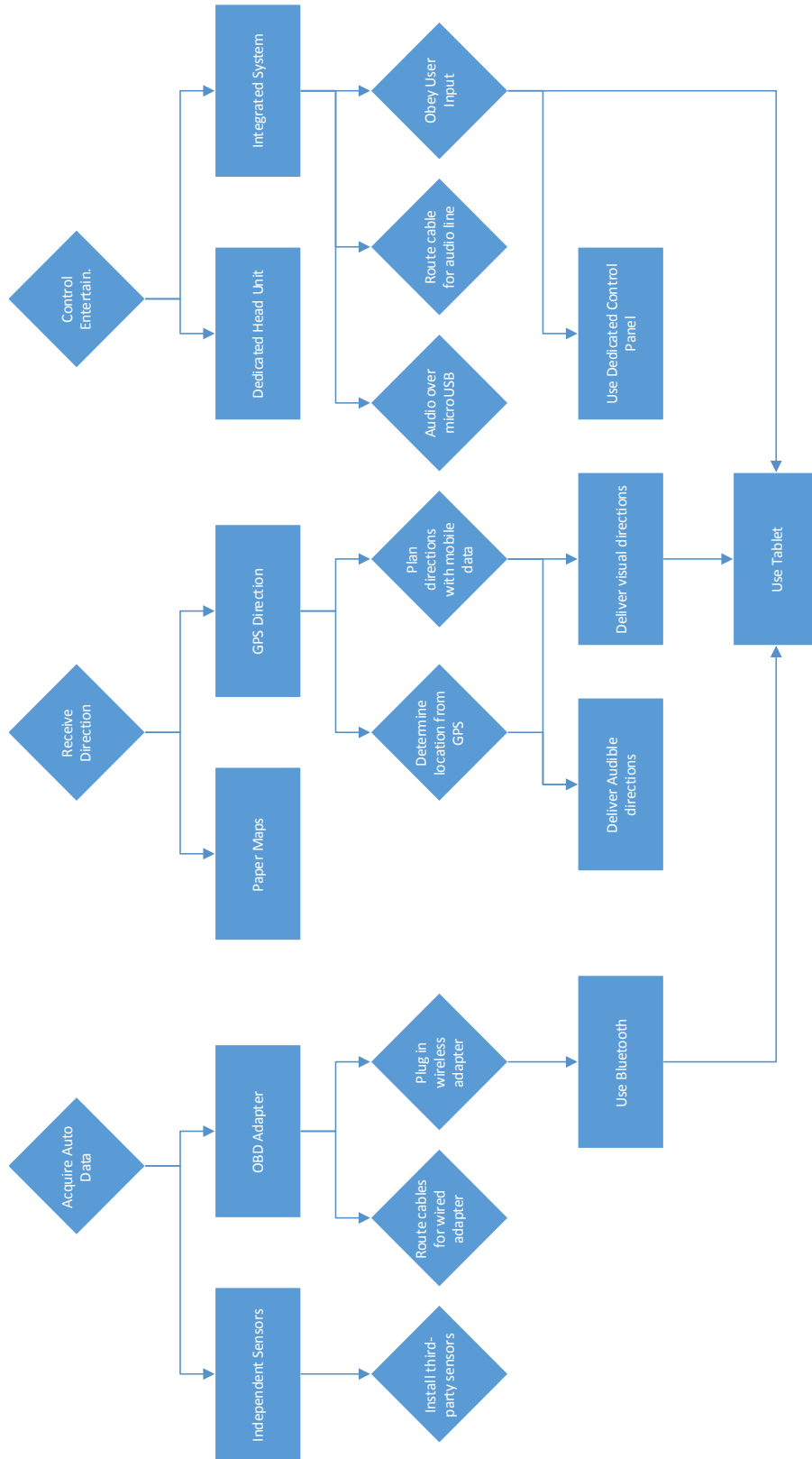
Illustrating Figures

Black Box Diagram



The black-box diagram above shows the overall functionality of our project. The tablet will be powered based on its own charge, but can use a 12 volt adapter to sustain power. The unit will take in the signals from the OBD II unit, that the vehicle already gathers, and display the information to allow the driver to see the diagnostics. This will be done by having the unit store and save the information. The information will be outputted graphically, but can also be outputted to through the car's audio system. The unit can also use the GPS and mobile data to update the driver with satellite information and traffic information. This head-unit will gather the information the car normally collects, and makes it more visible and usable for the driver.

Function-Means Tree



The function-means tree illustrates the hierarchy of functions that the project will perform and the various means used to accomplish those functions. One of the main functions of this head unit is to acquire Auto Data from the vehicle's OBDII port. This port receives information from sensors already installed on the vehicle. In order to receive any information not already ported to the OBDII port, we would need to then install independent third party sensors. In order to obtain the information from the OBDII port, we would need to either run a wired adapter, or use a wireless adapter that will negotiate via Bluetooth. All of this will then point back to the tablet which can then be accessed via the software.

Another one of the three main functions of the tablet is to provide directions to the user using GPS guidance. All standard GPS units come equipped to provide both audio and visual directions to the driver, so our tablet will have access to both GPS satellites and mobile data in order to determine the driver's current location and accurately provide the real-time directions to the tablet's screen. Since another one of the aims of our project is to output the tablet's audio to the car's speaker systems, the audio directions can easily be broadcast to the driver as well using either an auxiliary or microUSB connection, which will be explained in more detail below.

The final main function of the tablet is to control over the vehicle's entertainment system. This means that the tablet can be a full dedicated system, using radio applications, as well as downloaded audio. Otherwise, the system will be integrated. This means that there will also be a radio system that the tablet interfaced into. If the device is dedicated, then it will interface directly into the vehicle's speakers and everything else will be controlled by software. If the system is going to be integrated, then audio will need to be passed to the car's own entertainment system via audio over microUSB or a 3.5mm jack. All of the audio that is output although will be from the same source, which could be from radio applications via android such as Spotify, or Pandora, as well as downloaded music on the tablet itself.